

Amendment to the Claims

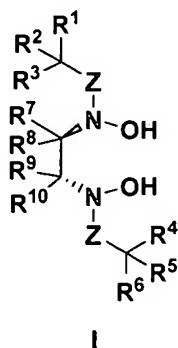
This listing of Claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Canceled)

2. (Currently Amended) A method of performing a catalytic asymmetric epoxidation comprising:

reacting an alkene or cyclic alkene with catalytic amounts of a chiral bishydroxamic acid ligand and a metal, in the presence of an oxidation reagent, to produce a chiral epoxide, where the chiral bishydroxamic acid ligand has a structure I:



where:

R^1 , R^2 , R^3 , R^4 , R^5 , and R^6 are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl;

or where R¹ and R², together with the atom to which they are attached, form a substituted or unsubstituted ring selected from the group consisting of cycloalkyl, heterocyclyl, ~~or~~ and aryl;

or where R⁴ and R⁵, together with the atom to which they are attached, form a substituted or unsubstituted ring selected from the group consisting of cycloalkyl, heterocyclyl, and aryl;
R⁷, R⁸, R⁹, and R¹⁰ are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl;

or where R⁷ and R⁹, together with the atoms to which they are attached, form a substituted or non-substituted ring selected from the group consisting of cycloalkyl and heterocyclyl;
—Z— is selected from the group consisting of —C(O)— and —S(O)₂—.

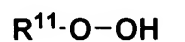
3. (Previously Presented) The method of claim 2, where the metal is selected from the group consisting of vanadium (IV), vanadium (V), molybdenum (IV), molybdenum (V), and molybdenum (VI).

4. (Original) The method of claim 3, where the metal is selected from the group consisting of vanadium (IV) and vanadium (V).

5. (Original) The method of claim 3, where the metal is selected from the group consisting of molybdenum (IV), molybdenum (V), and molybdenum (VI).

6-8. (Canceled)

9. (Previously Presented) The method of claim 2, where the oxidation reagent is an organic hydroperoxide with the following structure (II):



II

where, R^{11} is selected from the group consisting of alkyl, cycloalkyl, aryl, heteroaryl, and heterocyclyl.

10-11. (Canceled)

12. (Original) The method of claim 2, where R^1 , R^2 , R^3 , R^4 , R^5 , and R^6 are each independently selected from the group consisting of hydrogen, alkyl, alkoxy, and alkylamino.

13. (Original) The method of claim 2, where R^1 , R^2 , R^3 , R^4 , R^5 , and R^6 are each independently selected from the group consisting of cycloalkyl and heterocyclyl.

14. (Original) The method of claim 2, where R^1 , R^2 , R^3 , R^4 , R^5 , and R^6 are each independently selected from the group consisting of aryl, arylalkyl, heteroaryl, and halogen.

15. (Original) The method of claim 2, where:

R¹ and R², together with the atom to which they are attached, form a substituted or unsubstituted ring;

R⁴ and R⁵, together with the atom to which they are attached, form a substituted or unsubstituted ring; and

the ring formed by R¹ and R² is identical to the ring formed by R⁴ and R⁵.

16. (Original) The method of claim 2, where R⁷, R⁸, R⁹, and R¹⁰ are each independently selected from the group consisting of hydrogen, alkyl, alkoxy, and alkylamino.

17. (Original) The method of claim 2, where R⁷, R⁸, R⁹, and R¹⁰ are each independently selected from the group consisting of cycloalkyl and heterocyclyl.

18. (Original) The method of claim 2, where R⁷, R⁸, R⁹, and R¹⁰ are each independently selected from the group consisting of aryl, arylalkyl, and heteroaryl.

19. (Original) The method of claim 2, where R⁷ and R⁹, together with the atoms to which they are attached, form a ring.

20. (Original) The method of claim 19, where R⁸ and R¹⁰ are identical.

21. (Original) The method of claim 17, where R⁷ and R⁹, together with the atoms to which they are attached, form a ring.

22. (Original) The method of claim 21, where R^8 and R^{10} are identical.

23. (Original) The method of claim 2, where:

R^1 and R^2 are aryl groups;

R^3 is hydrogen;

R^4 and R^5 are aryl groups; and

R^6 is hydrogen.

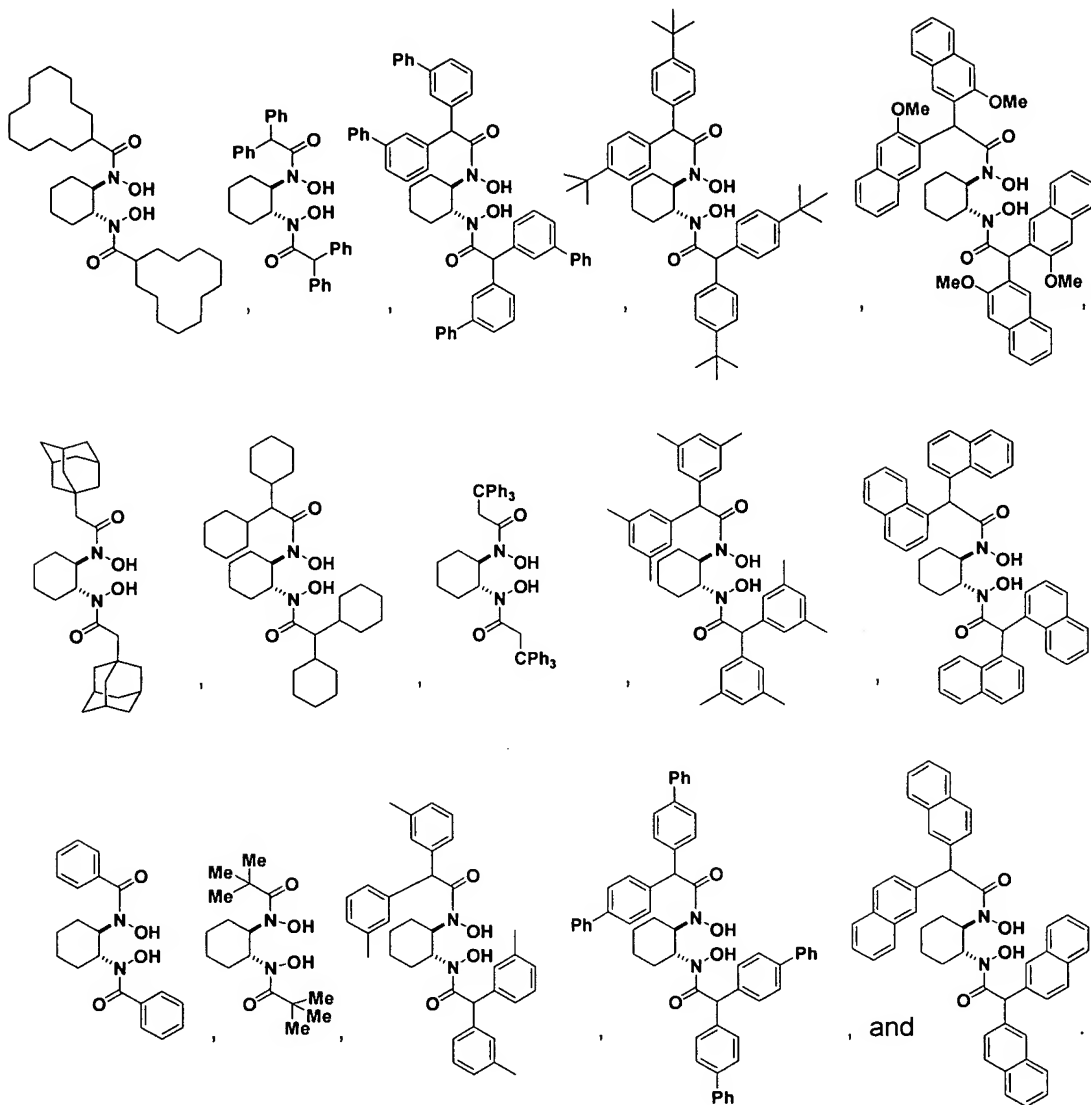
24. (Original) The method of claim 23, where:

R^1 and R^2 are identical; and

R^4 and R^5 are identical.

25. (Original) The method of claim 24, where R^1 , R^2 , R^4 , and R^5 are identical.

26. (Original) The method of claim 2, where the chiral bishydroxamic acid ligand (I) is selected from the group consisting of:



27-28. (Canceled)

29. (Original) The method of claim 3, where the metal is selected from the group consisting of $\text{VO}(\text{OPr}')_3$, $\text{VO}(\text{acac})_2$, $\text{VO}(\text{OEt})_3$, and $\text{MoO}_2(\text{acac})_2$.

30. (Canceled)

31. (Original) The method of claim 9, where the organic hydroperoxide is selected from the group consisting of tert-butyl hydroperoxide and cumene hydroperoxide.

32. (Original) The method of claim 9, where the organic hydroperoxide is tert-butyl hydroperoxide.

33. (Original) The method of claim 9, where the organic hydroperoxide is cumene hydroperoxide.

34. (Previously Presented) The method of claim 3, where the oxidation reagent is selected from the group consisting of tert-butyl hydroperoxide and cumene hydroperoxide.

35. (Previously Presented) The method of claim 3, where the oxidation reagent is tert-butyl hydroperoxide.

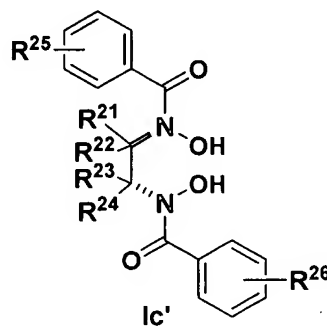
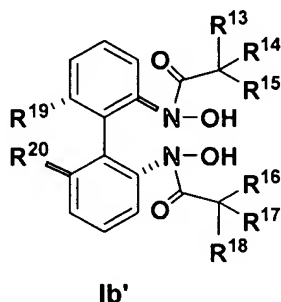
36. (Previously Presented) The method of claim 3, where the oxidation reagent is cumene hydroperoxide.

37. (Previously Presented) The method of claim 2, where the oxidation reagent is hydrogen peroxide.

38. (Previously Presented) The method of claim 3, where the oxidation reagent is hydrogen peroxide.

39-40. (Canceled)

41. (Currently Amended) ~~The method of claim 2,~~ A method of performing a catalytic asymmetric epoxidation comprising:
reacting an alkene or cyclic alkene with catalytic amounts of a chiral bishydroxamic acid ligand and a metal, in the presence of an oxidation reagent, to produce a chiral epoxide, where the chiral bishydroxamic acid ligand (I) is selected from the following formulae:



where:

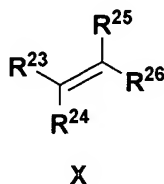
R¹³, R¹⁴, R¹⁵, R¹⁶, R¹⁷, and R¹⁸ are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl;

R¹⁹ and R²⁰ are each independently selected from the group consisting of hydrogen, halogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl;

R^{21} , R^{22} , R^{23} , and R^{24} are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl;

R^{25} and R^{26} are each independently selected from the group consisting of hydrogen, halogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl.

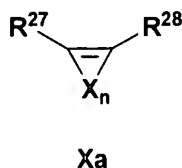
42. (Previously Presented) The method of claim 2, where the alkene is of the formula (X):



where:

R^{23} , R^{24} , R^{25} , and R^{26} are each independently selected from the group consisting of hydrogen, halogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, heteroaryl, and arylalkyl.

43. (Currently Amended) The method of claim 2, where the alkene is a cyclic alkene of the formula (Xa):



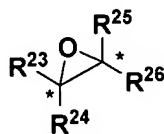
where:

R^{27} and R^{28} are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, aralkyl, heteroaryl, halogen, and alkene;
 n is 1, 2, 3, 4, 5, 6, or 6;

each X is independently selected from the group consisting of —
 $CR'R''$, — NR' —, and — O —;

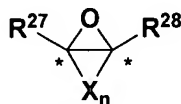
R' and R'' are each independently selected from the group consisting of hydrogen, alkyl, cycloalkyl, alkoxy, alkylamino, heterocyclyl, aryl, aralkyl, heteroaryl, and halogen.

44. (Previously Presented) The method of claim 42, where the chiral oxidation product is of the formula (Xb):



Xb

45. (Currently Amended) The method of claim 43, where the chiral oxidation product is of the formula (Xc):



XaXc.

46. (Previously Presented) The method of claim 2, where the reacting step is carried out in a solvent.

47. (Original) The method of claim 46, where the reacting step is carried out in a solvent selected from the group consisting of methylene chloride, toluene, chloroform, and ethyl acetate.

48. (Previously Presented) The method of claim 2, where the reacting step is carried out at a temperature of about -20 to about 25 °C.

49. (Previously Presented) The method of claim 2, where the reaction is carried out with about 0.001 to about 0.1 equivalents of the chiral bishydroxamic acid ligand (I).

50. (Previously Presented) The method of claim 2, where the reaction is carried out with about 0.005 to about 0.05 equivalents of metal.